

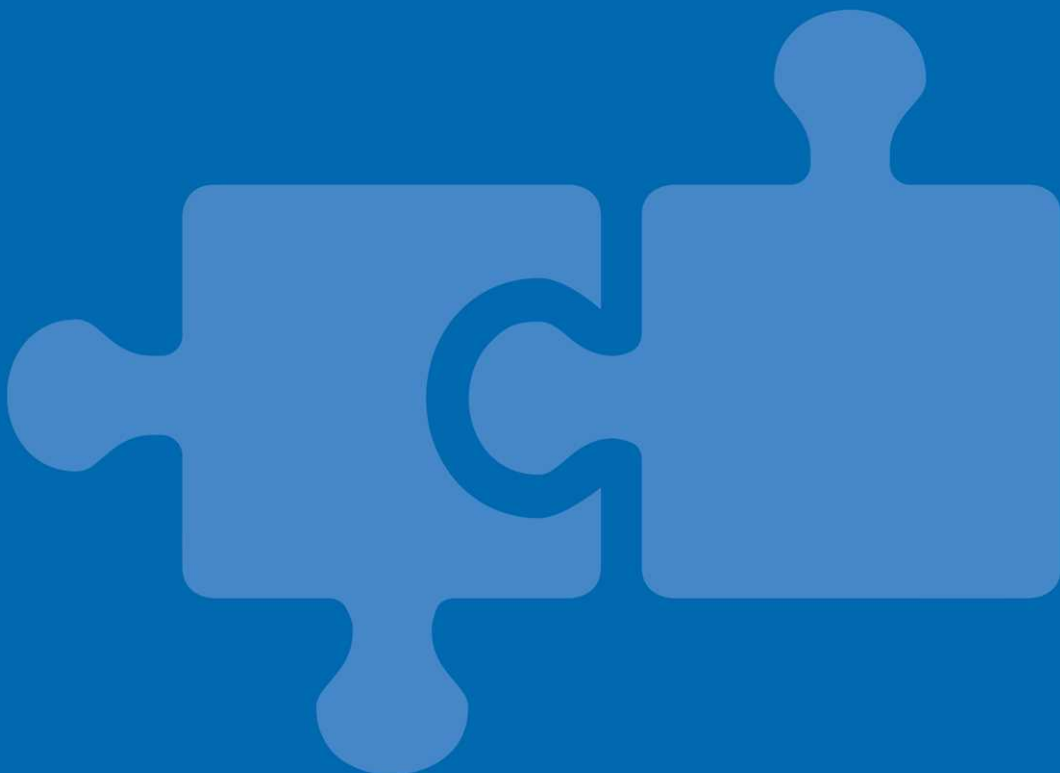


**BALTIMORE  
AIRCOIL COMPANY**



## **TRF TrilliumSeries™ Adiabatic Cooler**

### **RIGGING AND INSTALLATION INSTRUCTIONS**





# About rigging and installation

The BAC equipment should be rigged and installed as outlined in this bulletin.

These procedures should be thoroughly reviewed prior to the rigging and operation to acquaint all personnel with the procedures to be followed and to assure that all necessary equipment will be available at the job site. Be sure to have a copy of the unit certified drawing available for reference. If you do not have a copy of this drawing or if you need additional information about this unit, contact the local BAC representative. His name and phone number can be found on the [www.BaltimoreAircoil.com](http://www.BaltimoreAircoil.com). The model type and serial number of your equipment are indicated on the unit nameplate.

## Recommended maintenance and monitoring programme

Checks and adjustments	Start-Up	Every month	Every 3 months	Every 6 months	Every start of adiabatic season, Spring
Adiabatic pre-cooler water flow	X		X		X
Level switches (optional)	X				X
Tighten electrical connections	X			X	X
Rotation of fan(s)	X				
Motor voltage and current	X			X	X
Unusual noise and/or vibration	X		X		X

Inspections and monitoring	Start-up	Every month	Every 3 months	Every 6 months	Every start of adiabatic season, Spring
General condition of the equipment	X		X		X
Adiabatic pre-cooling pads	X		X		X
Heat transfer coil	X			X	
Water distribution pipe	X			X	X
Float switch (ball can move freely)	X	X			X

Cleaning procedures	Start-up	Every month	Every 3 months	Every 6 months	Every start of adiabatic season, Spring
Adiabatic pre-cooling media	X		X		X
Adiabatic gutter system				X	X
Sump				X	X
Coil (remove dust)					X



Auxiliary equipment integrated in the cooling system may require additions to the table above. Contact suppliers for recommended actions and their required frequency.

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## About engineering and application practices

This bulletin only refers to the assembly of the unit. To ensure a proper operation, a correct integration of the unit in the overall installation is mandatory. For good engineering and application practices on layout, levelling, connecting pipework, etc., please refer to our website:

<http://www.baltimoreaircoil.eu/knowledge-center/application-information>.

## Shipping

BAC cooling equipment is factory assembled to assure uniform quality and minimum field assembly. The adiabatic pre-cooler sections of the TrilliumSeries™ cooler unit are factory installed at both sides. Only in case of container transport the adiabatic pre-cooler section of one side is shipped separately and needs to be installed on site.

## Inspection before rigging

When the unit is delivered to the job site, it should be checked thoroughly to ensure all required items have been received and are free of any shipping damage prior to signing the bill of lading.

The following parts should be inspected:

- Exterior panels and covers
- Fans
- Heat exchanger
- Adiabatic pre-cooler sections

The fluid temperature sensor/pressure sensor is shipped loose and stored inside the electrical cabinet for installation on site.

## Unit weights

Before rigging any BAC equipment, the weight of each section should be verified on the unit certified drawing.



These weights are **approximate** and should be confirmed by weighing **before lifting** when available hoisting capacity provides little margin for safety.



### CAUTION

**Before an actual lift is undertaken, ensure no water, snow, ice or debris has collected in the sump or elsewhere in or on the unit. Such accumulations will add substantially to the equipment's lifting weight.**

In the event of extended lifts or where hazards exist, the lifting devices should be used in conjunction with safety slings placed under the unit.

## Layout Guidelines

In order to properly operate the unit, a minimum distance "d" needs to be observed at the air inlet sides. There are 2 cases that are taken into consideration in these guidelines. For an installation close to a solid wall, please refer to distance "d<sub>1</sub>". In case of a well installation with closed walls on all 4 sides, please refer to distance "d<sub>2</sub>".

Unit reference	d <sub>1</sub> (m)	d <sub>2</sub> (m)
TRF 1010E-*	0.8	1
TRF 1014E-*	1.2	1.3
TRF 1018E-*	1.4	1.6
TRF 1022E-*	1.7	1.8
TRF 1026E-*	1.8	1.9
TRF 1030E-*	2	2
TRF 1034E-*	2.1	2.1
TRF 1038E-*	2.2	2.2

For access to the pump, please make sure that there are no obstructions, such as for example railings, closer than 70cm. It is advisable to keep 1 m free space in front of the electrical panel and 1.5 m free space in front of the coil connections to facilitate access and piping.

## Anchoring

The unit must be properly anchored in place.

Refer to the suggested support details on the certified drawing for locations of the mounting holes. Anchor bolts must be provided by others.

Holes suitable for 20 mm bolts are provided in the bottom flange of the cooler support structure for bolting the unit to the support beams.

## Leveling

The unit must be level for proper operation and ease of piping.

The unit should be level to 0,5 mm/m over the unit length and width.



Support beams must also be level as shims should not be used between pan and support beams to level the unit.

## Connecting pipework

All piping external to BAC cooling equipment must be supported separately.

In case the equipment is installed on vibration rails or springs, the piping must contain compensators to eliminate vibrations carried through the external pipework.

## Purge requirements

The installer of BAC closed circuit cooling towers must ensure a proper air purging of the system prior to operation.

Entrained air can restrict the capacity of the cooler, resulting in higher process temperatures.

All connections (installed by others) must be leak free and tested accordingly.

## Freeze protection

These products must be protected against damage and/or reduced effectiveness due to possible freeze-up by mechanical and operational methods. Please contact your local BAC representative for recommended protection alternatives.

## Safety precautions

All electrical, mechanical and rotating machinery constitutes a potential hazard, particularly for those not familiar with its design, construction and operation. Accordingly, adequate safeguards (including use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public (including minors) from injury and to prevent damage to the equipment, its associated system and the premises.

If there is doubt about safe and proper rigging, installation, operation or maintenance procedures, contact the equipment manufacturer or his representative for advice.

When working on operating equipment, be aware that some parts may have an elevated temperature. Any operations on elevated level have to be executed with extra care to prevent accidents.



### CAUTION

**Surface of coil/piping can be hot.**

## AUTHORIZED PERSONNEL

The operation, maintenance and repair of this equipment should be undertaken only by personnel authorized and qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated systems and controls and the procedures set forth in this and other relevant manuals. Proper care, personal protective equipment, procedures and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage. Personnel must use personal protective equipment where necessary (gloves, ear plugs, etc...)

## MECHANICAL SAFETY

Mechanical safety of the equipment is in accordance with the requirements of the EU machinery directive. Depending upon site conditions it also may be necessary to install items such as bottom screens, ladders, safety cages, stairways, access platforms, handrails and toe boards for the safety and convenience of the authorized service and maintenance personnel.

At no time this equipment should be operated without all fan screens in place and properly secured. Since the equipment operates at variable speeds, steps must be taken to avoid operating at or near the installation's "critical speed".

For more information consult your local BAC representative.

## ELECTRICAL SAFETY

No service work should be performed on or near the fans unless motors are electrically isolated.

## FLAMMABLE MATERIAL

The pre-coolers are made of flammable material and should be removed when performing hot works on the unit itself. No actions generating sparks should be performed on or near the unit.

## LOCAL REGULATIONS

Installation and operation of cooling equipment may be subject to local regulations, such as establishment of risk analysis. Ensure regulatory requirements are consistently met.

## LIFTING



### CAUTION

**Failure to use designated lifting points can result in a dropped load causing severe injury, death and/or property damage. Lifts must be performed by qualified riggers following BAC published Rigging Instructions and generally accepted lifting practices. The use of supplemental safety slings may also be required if the lift circumstances warrant its use, as determined by the rigging contractor.**

## Non-walking surfaces

Access to and maintenance of any component needs to be performed in accordance with all local applicable laws and regulations. If the proper and required access means are not present, temporary structures need to be foreseen. Under no circumstance can one use parts of the unit, that are not designed as an access mean, unless measures can be taken to mitigate any risks that might occur from doing so.

## Modifications by others

Whenever modifications or changes are made by others to the BAC equipment without written permission of BAC, the party who has done the modification becomes responsible for all consequences of this change and BAC declines all liability for the product.



## Warranty

BAC will guarantee all products to be free from manufactured defects in materials and workmanship for a period of 24 months from the date of shipment. In the event of any such defect, BAC will repair or provide a replacement. For more details, please refer to the Limitation of Warranties applicable to and in effect at the time of the sale/purchase of these products. You can find these terms and conditions on the reverse side of your order acknowledgement form and your invoice.



# 2

## TRF RIGGING

### General notes

1. The equipment arrives on site by truck.  
A crane must always be used to unload the unit from the truck. Do not attempt to unload the unit using a forklift.
2. If the unit is shipped in a closed box container, one side of the pre-cooling media construction is shipped separately in the container and needs to be installed on site.
3. Spreader bars of the full width of the section must be used between the lifting cables to prevent damage to the section.
4. For extended lifts or where hazards exist, it is recommended to use the lifting devices in conjunction with safety slings placed under the unit.
5. For each unit, only one lift is required. Lifting ears are foreseen on each unit.



*Use shackles in lifting ears to lift the unit*

6. Attach the lifting devices to the unit as per rigging methods below. Unload the unit from the truck.
7. Install the unit in its final position and anchor to the support beams (supplied by others).



**CAUTION**

When the unit is installed, all metal parts created by drilling, fastening self tapping screws, grinding, welding or other mechanical works must be removed from the unit. If they remain on the unit (typically on the double break flanges) this could lead to corrosion and eventually coating damage.



**CAUTION**

Before an actual lift is undertaken, ensure no water, snow, ice or debris has collected in the unit. Such accumulations will add substantially to the equipment's lifting weight.

## Rigging information

Model	Width "W" mm	Length "L <sub>1</sub> " mm	Height for slings "L <sub>2</sub> " mm
4-Fan	3000	2684	8000
6-Fan	3000	4020	8000
8-Fan	3000	5220	8000
10-Fan	3000	6420	8000
12-Fan	3000	6420	8000
14-Fan	3000	6420	8000
16-fan	3000	6420	8000
18-fan	3000	6420	8000



**CAUTION**

Maximum deviation on "W" dimension is 700 mm from the side of the unit.

## Rigging method

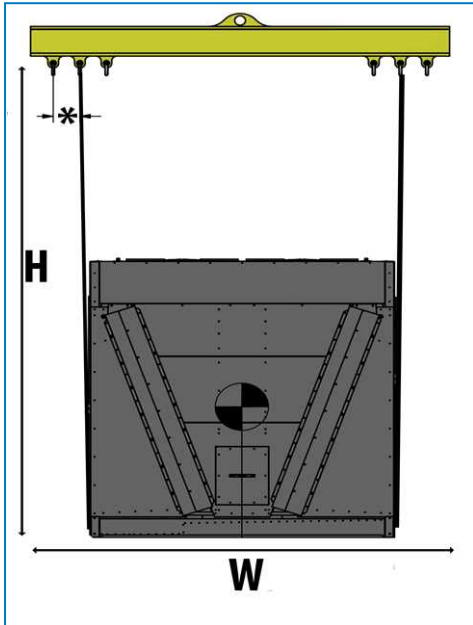
To avoid damage during hoisting, a spreader beam should be used and the angles shown in the diagrams below must be observed.



**CAUTION**

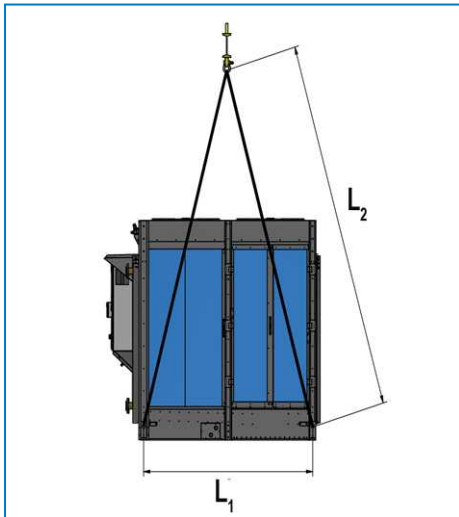
Units need to be lifted from the 4 bottom lifting points.

**End View**

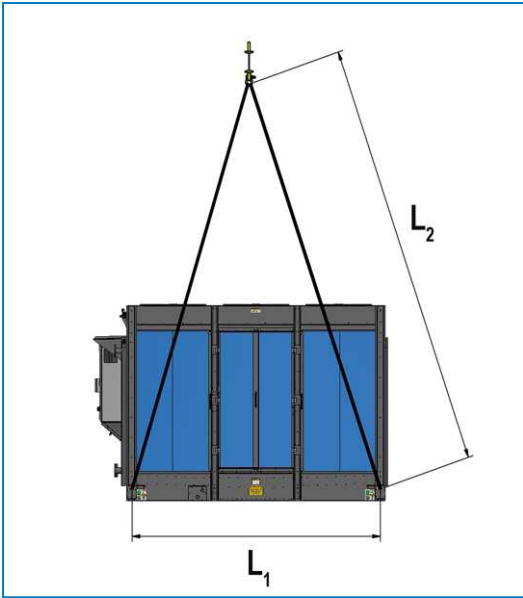


End view

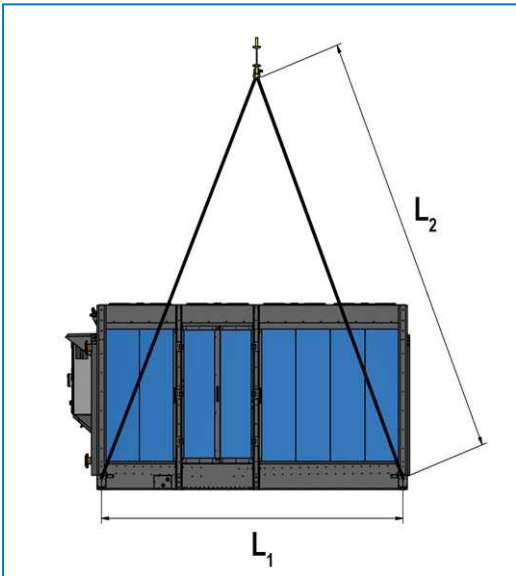
**Side View**



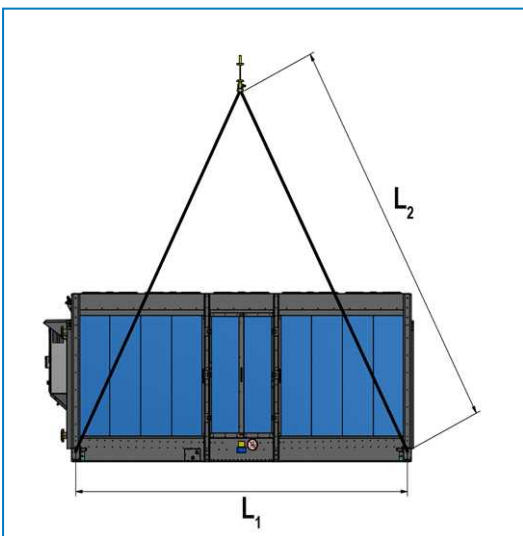
4-fan units



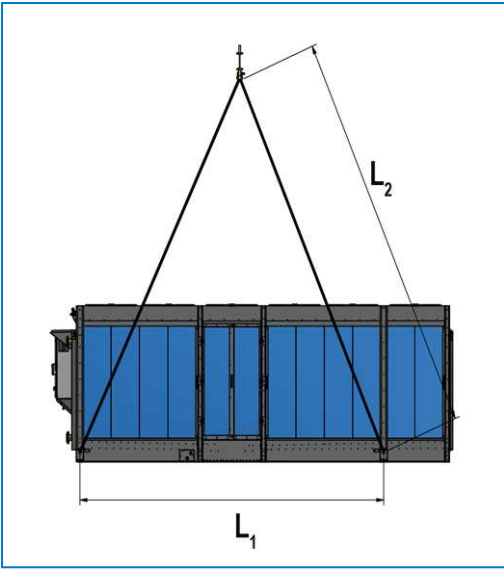
6-fan units



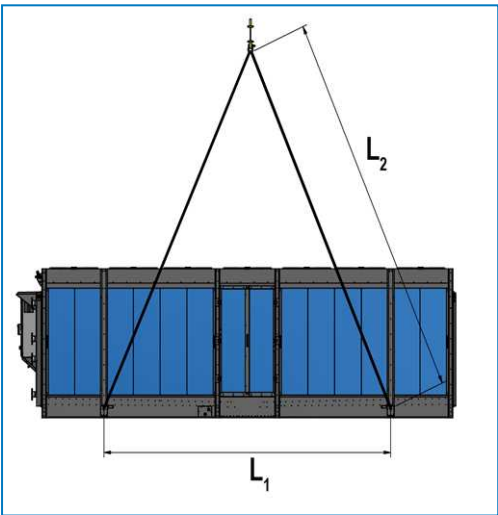
8-fan units



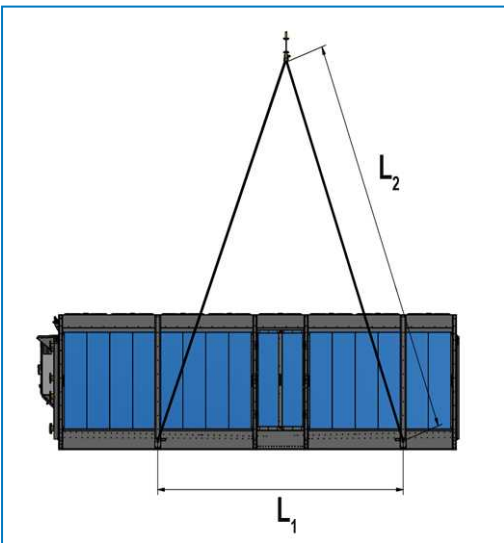
10-fan units



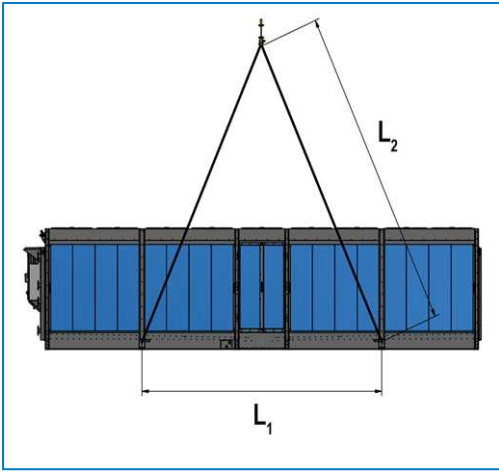
12-fan units



14-fan units



16-fan units



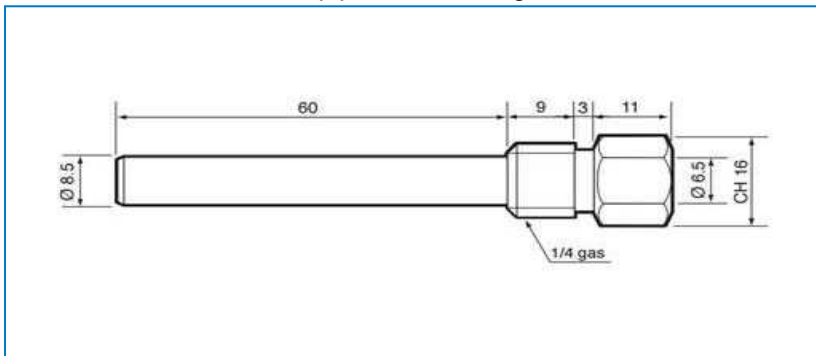
18-fan units



Please note that the centre of gravity is not centered on the unit.

## Installation of the fluid temperature sensor

A temperature sensor is supplied with the unit and is shipped inside the electrical panel together with a socket for installation in the return pipe. The drawing below shows the dimensions of the socket (values in mm):



The socket is equipped with a PG7 - IP68 cable gland applied to the hexagonal end to secure the cable. The socket and sensor need to be installed in accordance with the applicable rules of good workmanship. The socket needs to be installed behind the manifold connecting the coil connections from both sides. The minimum distance between the manifold and the socket is advised to be  $\pm 1$  m in order to ensure the flow from both sides is well mixed and the correct temperature is relayed to the PLC.

## Installation of screw-on flanges

Care must be taken when installing screw-on flanges on the fluid-connections of the unit to make sure no forces are transferred from the flange to the copper header of the unit. These forces may damage the header and result in coil leaks. Apply the proper opposite force by means of a chain pipe wrench, as shown in the following picture to make sure no force is put on the copper tubes.



*Installing screw-on flange*



## TRF OPTIONAL ACCESSORIES ASSEMBLY

All optional accessories are factory installed.



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## TRF INSPECTION PRIOR TO START-UP


### General

Prior to start-up, the following services, which are described in detail in the Operating and Maintenance Manual (see table "Recommended maintenance and monitoring programme" ) must be performed.

Proper start-up procedures and scheduled periodic maintenance will prolong the life of the equipment and ensure trouble-free performance for which the unit is designed.

### Electrical Panel

Each unit is equipped with an electrical panel.

 When operating above nominal speed, be aware of the potential risk for overload or mechanical damages.



*Control panel*

The fan speed is controlled on the basis of the actual process fluid return temperature and the design return temperature, ensuring a minimum electrical consumption and noise levels.

The adiabatic pre-cooling will be activated and stopped on the basis of a pre-programmed logical combination of the return temperature and the ambient temperature (release set-point). Default settings will not activate adiabatic pre-cooling unless all fans are running at maximum permissible speed and the dry-to-adiabatic release set-point is reached.

The adiabatic control logic is pre-programmed and is ready for operation.

Depending on the actual size of the installation, the controller pre-programmed PI process parameters may need to be adjusted.



Controlling the fan speed will have a direct impact on the heat transfer of the unit. A low fan speed will lower the airflow through the unit, resulting in a low heat transfer. A high fan speed will result in a higher heat transfer. It is only useful to activate the pads when the ambient temperature is high enough.

## OPERATIONAL SAFETY

If BAC does not deliver the controls, this is the customer's responsibility. The unit's controls are - in part - responsible for the proper operational safety of the unit as a whole. Hence, these controls need to be designed to make sure that no unsanitary situation can present itself due to a poor operation of the unit.

## ELECTRICAL FIELD WIRING



### CAUTION

**All operations described below must be performed by a licensed electrical technician and must comply with local regulations.**

The equipment is standard provided with a door interlocked main power switch (5S0), which is factory fitted. Connect electrical power to the power switch through a 3-pole cable, with ground, of adequate cross section for the main fuse rating.



The power tension must not fluctuate more than  $\pm 10\%$ . The imbalance between the phases must not be greater than  $\pm 2\%$ .

Connect the immersion sensor to the terminal strip as indicated in the wiring diagram.

## PRE-COMMISSIONING

1. With main power switch open, check all electrical connections in electrical panel to be sure that they are tight and provide good electrical contact. Although connections were tightened at the factory, they may have loosened enough in shipment to cause a malfunction.
2. Check and inspect all water piping. Make sure flow direction is correct in counterflow, as shown by the arrows on the connectors.
3. Check that the immersion sensor is properly located in the main cold water pipe so that the water is well mixed where the temperature is measured.

## START-UP

1. Turn the main power switch 5S0 to the "off" position. Measure the voltage on the electrical power panel.
2. Put all circuit breakers F1, F2 etc. in the "on" position. Close the electrical panel.
3. Turn on the main power switch 5S0. The amber indicating lamp or the front panel lights up. The PLC is energised. For detailed starting instructions please refer to the Operating and Maintenance Instructions, section Operating Instructions, subsection "Operating instructions for digital controller".
4. The unit will now operate according to the load demand. When the fans reach the maximum fan speed; the controller will energize the adiabatic system. The two sides of the pre-cooler controlled in sequence by the controller, by energising the appropriate solenoid valves.

## EMERGENCY STOP

A red mushroom switch 7S0 on the front panel is provided to allow the unit emergency stop in case of malfunction. The unit can be re-started by rotating the 7S0 emergency switch, as shown by its arrow and then following the starting procedure of the unit.

## WEEK-END OR TEMPORARY SHUTDOWN

The unit must be shutdown by the "ON/OFF" switch of the digital controller either locally or through the BMS system.



## The service expert for BAC equipment

We offer tailored services and solution for BAC cooling towers and equipment.

- Original spare parts and fill -for an efficient, safe and year round reliable operation.
- Service solutions - preventive maintenance, repairs, refurbishments, cleaning and disinfection for reliable trouble-free operation.
- Upgrades and new technologies - save up energy and improve maintenance by upgrading your system.
- Water treatment solutions - equipment for controlling corrosion scaling and proliferation of bacteria.

For more details, contact your local BAC representative for further information and specific assistance at [www.BACservice.eu](http://www.BACservice.eu)

## More information

### REFERENCE LITERATURE

- Eurovent 9-5 (6) Recommended Code of Practice to keep your Cooling System efficient and safe. Eurovent/Cecomaf, 2002, 30p.
- Guide des Bonnes Pratiques, Legionella et Tours Aéroréfrigérantes. Ministères de l'Emploi et de la Solidarité, Ministère de l'Economie des Finances et de l'Industrie, Ministère de l'Environnement, Juin 2001, 54p.
- Voorkom Legionellose. Ministerie van de Vlaamse Gemeenschap. December 2002, 77p.
- Legionnaires' Disease. The Control of Legionella Bacteria in Water Systems. Health & Safety Commission. 2000, 62p.
- Hygienische Anforderungen an raumluftechnische Anlagen. VDI 6022.

### INTERESTING WEBSITES

Baltimore Aircoil Company	<a href="http://www.BaltimoreAircoil.com">www.BaltimoreAircoil.com</a>
BAC Service website	<a href="http://www.BACservice.eu">www.BACservice.eu</a>
Eurovent	<a href="http://www.eurovent-certification.com">www.eurovent-certification.com</a>
European Working Group on Legionella Infections (EWGLI)	<a href="http://EWGLI">EWGLI</a>
ASHRAE	<a href="http://www.ashrae.org">www.ashrae.org</a>
Uniclîma	<a href="http://www.uniclîma.fr">www.uniclîma.fr</a>
Association des Ingénieurs et techniciens en Climatique, Ventilation et Froid	<a href="http://www.aicvf.org">www.aicvf.org</a>
Health and Safety Executive	<a href="http://www.hse.gov.uk">www.hse.gov.uk</a>

### ORIGINAL DOCUMENTATION



This manual is originally made in English. Translations are provided for your convenience. In the event of discrepancies, the English original text shall prevail over the translation.



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COOLING TOWERS

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CLOSED CIRCUIT COOLING TOWERS

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ICE THERMAL STORAGE

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EVAPORATIVE CONDENSERS

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HYBRID PRODUCTS

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PARTS, EQUIPMENTS & SERVICES

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GREEN at heart



[www.BaltimoreAircoil.com](http://www.BaltimoreAircoil.com)

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Please refer to our website for local contact details.

Industriepark - Zone A, B-2220 Heist-op-den-Berg, Belgium

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